External Awards

Medal with Purple Ribbon
Winner: Yutaka Miyamoto, NTT Network Innovation Laboratories
Date: April 29, 2021
Organization: Japan

For development of high-capacity optical transmission scheme using coherent-multicarrier multilevel modulation.

Optica Fellow
Winner: Shinji Matsuo, NTT Device Technology Laboratories
Date: November 3, 2021
Organization: Optica (formerly OSA)

For pioneering contributions to ultra-high-speed and low-power-consumption membrane lasers.

Visual Movie Award
Winner: Riku Takahashi, NTT Basic Research Laboratories
Date: November 11, 2021
Organization: The Society for Chemistry and Micro-Nano Systems (CHEMINAS)

For "Construction of Vessel-like Tissue Using Fluidic Device Based on Hydrogel Film."
Published as: R. Takahashi, A. Tanaka, and M. Yamaguchi, "Construction of Vessel-like Tissue Using Fluidic Device Based on Hydrogel Film," CHEMINAS 44, IR-01, Nov. 2021.

Highly Commended Paper Award
Winners: Kei Fujimoto, Ko Natori, Masashi Kaneko, Akinori Shiraga, NTT Network Innovation Center
Date: November 25, 2021
Organization: The 31st International Telecommunication Networks and Applications Conference 2021 (IEEE ITNAC 2021)

For "NIDP: Low-latency Networking without Application Customization in Virtual Machine."
Published as: K. Fujimoto, K. Natori, M. Kaneko, and A. Shiraga, "NIDP: Low-latency Networking without Application Customization in Virtual Machine," IEEE ITNAC 2021, Nov. 2021.

APSEC 2021 Best ERA Paper
Winners: Hiroto Watanabe, Shinsuke Matsumoto, Yoshiki Higo, Shinji Kusumoto, Osaka University; Toshiyuki Kurabayashi, Hiroyuki Kirinuki, Haruto Tanno, NTT Software Innovation Center
Date: December 8, 2021
Organization: The 28th Asia-Pacific Software Engineering Conference (APSEC 2021)

For "Applying Multi-objective Genetic Algorithm for Efficient Selection on Program Generation."
Published as: H. Watanabe, S. Matsumoto, Y. Higo, S. Kusumoto, T. Kurabayashi, H. Kirinuki, and H. Tanno, "Applying Multi-objective Genetic Algorithm for Efficient Selection on Program Generation," APSEC 2021, Dec. 2021.

2021 IEICE Communications Society OCS Young Researchers Award
Winner: Takeo Sasai, NTT Network Innovation Laboratories
Date: December 14, 2021
Organization: The Institute of Electronics, Information and Communication Engineers (IEICE) Technical Committee on Optical Communication Systems (OCS)

For "Digital Backpropagation for Optical Path Monitoring—Loss and Dispersion Profile Estimation—."
Published as: T. Sasai, M. Nakamura, S. Yamamoto, E. Yamazaki, H. Nishizawa, and Y. Kisaka, "Digital Backpropagation for Optical Path Monitoring—Loss and Dispersion Profile Estimation—," IEICE Tech. Rep., Vol. 120, No. 309, OCS2020-39, pp. 61–64, Jan. 2021.

Papers Published in Technical Journals and Conference Proceedings

Quantum Remote Sensing under the Effect of Dephasing
H. Okane, H. Hakoshima, Y. Takeuchi, Y. Seki, and Y. Matsuzaki
Physical Review A, Vol. 104, No. 6, 062610, December 2021.

The quantum remote sensing (QRS) is a scheme to add security about the measurement results of a qubit-based sensor. A client delegates a measurement task to a remote server that has a quantum sensor, and eavesdropper (Eve) steals every classical information stored in the server side. By using quantum properties, the QRS provides an asymmetricity about the information gain where the client gets more information about the sensing results than Eve. However, quantum states are fragile against decoherence, and so it is not clear whether such a QRS is practically useful under the effect of realistic noise. Here, we investigate the performance of the QRS with dephasing during the interaction with the target fields. In the QRS, the client

and server need to share a Bell pair, and an imperfection of the Bell pair leads to a state preparation error in a systematic way on the server side for the sensing. We consider the effect of both dephasing and state preparation error. The uncertainty of the client side decreases with the square root of the repetition number M for small M, which is the same scaling as the standard quantum metrology. On the other hand, for large M, the state preparation error becomes as relevant as the dephasing, and the uncertainty decreases logarithmically with M. We compare the information gain between the client and Eve. This leads us to obtain the conditions for the asymmetric gain to be maintained even under the effect of dephasing. Then, we can quantify how much information the client can gain while preserving the information asymmetricity.

Suppression of Intensity Noises in Forward-pumped Raman Amplifier Utilizing Depolarizer for Multiple Pump Laser Sources

H. Kawakami, S. Kuwahara, and Y. Kisaka

Journal of Lightwave Technology, Vol. 39, No. 23, pp. 7417–7426, December 2021.

We investigate the random intensity noises that occur in forward-pumped distributed Raman amplifier systems. First, we show pump-to-signal intensity noise transfer characteristics, which strongly depend on the group velocities of pump light and signal light in optical fiber used as a gain medium. When signal light is in the C-band, dispersion shifted fiber (DSF) transfers much larger noise compared with standard single mode fiber. Next, we discuss the origin of the noise induced in pump light. We define the concept of "synthesized polarization" and show that fluctuation in the state of synthesized polarization (SOSP) can induce a large gain instability even if the relative intensity noise (RIN) of each pump laser source is negligible experimentally. Next, we propose a novel optical depolarizer for pump light. It can simultaneously depolarize pump light generated by multiple laser sources. Moreover, it can manage optical phases precisely to suppress the gain instability induced by the fluctuation in SOSP. Finally, we present a measurement of the Q factor of a 16-QAM signal (32 Gbaud) after 35-km transmission, with and without a forward-pumped Raman amplifier. Two pump laser sources with RINs of –134 to –126 dB/Hz were depolarized by the proposed depolarizer, and the generated on-off gain was 7 dB. Though amplified signal light was in the C-band and the gain medium was DSF, 16-QAM transmission specifications were successfully improved, and acceptable noise was observed for 5 hours operation.
